

introducing into the amorphous semiconductor film an element which promotes crystallization of the amorphous semiconductor film;

crystallizing the amorphous semiconductor film by a first heat treatment to form a crystalline semiconductor film;

introducing an impurity element belonging to Group 15 into a first portion of the crystalline semiconductor film while a second portion of the crystalline semiconductor film is not introduced with the impurity;

wherein the first and second portions of the crystalline semiconductor film are in contact with a same insulating surface over the substrate;

gettering the element which promotes crystallization by a second heat treatment to the first portion of the crystallized semiconductor film; and

patterning the crystallized semiconductor film to form a crystalline semiconductor island in the second portion thereby removing the first portion of the crystalline semiconductor film;

forming an active layer of the thin film transistor using the crystalline semiconductor island,

(end) wherein the heat treatment during gettering the element is performed in a temperature range not exceeding a glass transition point of the substrate.

9. (Three Times Amended) A method of manufacturing a semiconductor device including at least a thin film transistor, said method comprising the steps of:

forming an amorphous semiconductor film comprising silicon over a substrate;

selectively introducing into a first portion of the amorphous semiconductor film an element which promotes crystallization of the amorphous semiconductor film;

crystallizing the amorphous semiconductor film by a first heat treatment to form a crystalline semiconductor film, so that a crystallization proceeds from the first portion in a lateral direction to the insulating surface;

introducing an impurity element belonging to Group 15 into a second portion of the crystalline semiconductor film while a third portion of the crystalline semiconductor film is not introduced with the impurity;

wherein the second and third portions of the crystalline semiconductor film are in contact with a same insulating surface over the substrate;

gettering the element second portion of the
crystalline semiconductor film; and

patterning the crystalline semiconductor film to form
a crystalline semiconductor island in the third portion thereby
removing the second portion of the crystalline semiconductor
film;

forming an active layer of the thin film transistor
using the crystalline semiconductor island,

wherein the second heat treatment during gettering the
element is performed in a temperature range not exceeding a
glass transition point of the substrate.

17. (Three Times Amended) A method of manufacturing a
semiconductor device including at least a thin film transistor,
said method comprising the steps of:

forming an amorphous semiconductor film comprising
silicon over a substrate;

introducing into the amorphous semiconductor film an
element which promotes crystallization of the amorphous
semiconductor film;

crystallizing the amorphous semiconductor film by a
first heat treatment to form a crystalline semiconductor film;

irradiating a laser light or an intense light to the crystalline semiconductor film;

introducing an impurity element belonging to Group 15 into a first portion of the crystalline semiconductor film after the irradiating step, while a second portion of the crystalline semiconductor film is not introduced with the impurity;

wherein the first and second portions of the crystalline semiconductor film are in contact with a same insulating surface over the substrate;

gettering the element by a second heat treatment to the first portion of the crystalline semiconductor film;

patterning the crystalline semiconductor film to form a crystalline semiconductor island in the second portion thereby removing the second portion of the crystalline semiconductor film;

forming an active layer of the thin film transistor using the crystalline semiconductor island,

wherein the second heat treatment during gettering is performed in a temperature range not exceeding a glass transition point of the substrate.

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25. (Three Times Amended) A method of manufacturing a semiconductor device including at least a thin film transistor, said method comprising the steps of:

forming an amorphous semiconductor film comprising silicon over a substrate;

selectively introducing into a first portion of the amorphous semiconductor film an element which promotes crystallization of the amorphous semiconductor film;

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crystallizing the amorphous semiconductor film by a first heat treatment to form a crystalline semiconductor film, so that a crystallization proceeds from the first portion of the amorphous semiconductor film in a lateral direction to the insulating surface;

irradiating a laser light or an intense light to the crystalline semiconductor film;

introducing an impurity element belonging to Group 15 into a second portion of the crystalline semiconductor film after the irradiating step, while a third portion of the crystalline semiconductor film is not introduced with the impurity;

wherein the second and third portions of the crystalline semiconductor film are in contact with a same insulating surface over the substrate;

getting the element by a second heat treatment to the second portion of the crystalline semiconductor film;

claim
patterning the crystalline semiconductor film to form a crystalline semiconductor island in the third portion thereby removing the second portion of the crystalline semiconductor film;

forming an active layer of the thin film transistor using the crystalline semiconductor island,

wherein the second heat treatment during getting is performed in the temperature range not exceeding a glass transition point of the substrate.

50 D11 45. (Twice Amended) A method of manufacturing a semiconductor device including at least a thin film transistor,

the said method comprising the steps of:

forming an amorphous semiconductor film comprising silicon over a substrate;

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introducing into the amorphous semiconductor film an element which promotes crystallization of the amorphous semiconductor film;

crystallizing the amorphous semiconductor film by a first heat treatment to form a crystalline semiconductor film;

introducing an impurity element belonging to Group 15 into a first portion of the crystalline semiconductor film while a second portion of the crystalline semiconductor film is not introduced with the impurity;

wherein the first and second portions of the crystalline semiconductor film are in contact with a same insulating surface over the substrate;

gettering the element which promotes crystallization by a second heat treatment into the first portion of the crystalline semiconductor film;

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patterning the crystalline semiconductor film to form a crystalline semiconductor island in the second portion thereby removing the first portion of the crystalline semiconductor film;

forming a gate insulating film over the crystalline semiconductor island;

forming at least one gate electrode comprising a metal on the gate insulating film;

doping an impurity into at least a second portion of the crystalline semiconductor island to form a lightly doped drain region; and

forming at least a source region and a drain region by doping an impurity into third portions of the crystalline semiconductor island.

wherein the second heat treatment during gettering is performed in a temperature range not exceeding a glass transition point of the substrate.

52. (Twice Amended) A method of manufacturing a semiconductor device including at least a thin film transistor, said method comprising the steps of:

forming an amorphous semiconductor film comprising silicon over a substrate;

introducing into the amorphous semiconductor film an element which promotes crystallization of the amorphous semiconductor film;

crystallizing the amorphous semiconductor film by a first heat treatment to form a crystalline semiconductor film;

introducing an impurity element belonging to Group 15 into a first portion of the crystalline semiconductor film while a second portion of the crystalline semiconductor film is not introduced with the impurity;

gettering the element by a second heat treatment into the first portion of the crystalline semiconductor film;

claim 1
patterning the crystalline semiconductor film to form
a crystalline semiconductor island in the second portion thereby
removing the first portion of the crystalline semiconductor
film;

forming a gate insulating film over the crystalline
semiconductor island;

forming at least one gate electrode comprising a metal
on the gate insulating film;

claim 2
doping an impurity into at least a second portion of
the crystalline semiconductor island to form a lightly doped
drain region;

forming at least a source region and a drain region by
doping an impurity into third portions of the crystalline
semiconductor island;

forming an interlayer insulating film comprising
silicon over the gate electrode;

forming an interlayer insulating film comprising an
organic resin film over the interlayer insulating film; and

forming a pixel electrode that is electrically
connected to the source region or drain region through a contact
hole over the interlayer film;

Claim wherein the second heat treatment during gettering is performed in a temperature range not exceeding a glass transition point of the substrate.
